CLAIMS:

1. A method for the treatment of an aqueous stream containing both anionic and cationic species, the method comprising the steps of:

continuously circulating water through an essentially closed loop incorporating an ion adsorption unit comprising a water permeable layer of an ion adsorbing material;

feeding to the essentially closed loop an aqueous solution containing the anionic and the cationic species;

continuously passing the circulating water including the aqueous solution containing the ionic and the cationic species through the ion adsorbing material in the ion adsorption unit while applying an electric potential across the thickness of the layer of ion adsorbing material and removing from the ion adsorption unit more concentrated aqueous solutions of the separate ionic species;

continuously discharging from the ion adsorption unit the more concentrated aqueous solution of one ionic species;

continuously discharging from the ion adsorption unit the aqueous solution depleted in anionic and cationic species;

continuously passing the more concentrated solution of the other ionic species through a reaction unit in which the ionic species reacts to form a water-insoluble solid material;

continuously recycling eluate from the reaction unit to the ion

adsorption unit; and, if necessary,

adding to the closed loop a quantity of water corresponding the quantity of aqueous solution removed from the reaction unit.

2. A method according to claim 1, wherein the anionic species is ammonium and the cationic species is fluoride.

3. A method according to claim 2, wherein a concentrated aqueous ammonium solution is continuously discharged from the ion adsorption unit.

4. A method according to claim 2 or claim 3, wherein a concentrated aqueous fluoride solution is continuously passed from the ion adsorption unit into a calcium precipitation unit thereby to form CaF_2.

5. A method according to claim 4, wherein a source of calcium as a solution or slurry is continuously admitted to the calcium precipitation unit.

6. A method according to claim 5, wherein the source of calcium is a slurry of calcium carbonate or of calcium hydroxide.

7. A method according to claim 5 or claim 6, wherein depleted aqueous solution continuously discharged from the ion adsorption unit is used to prepare the solution or slurry of calcium.

8. A method according to claim 5 or claim 6, wherein eluate from the calcium precipitation unit is used to prepare the solution or slurry of calcium.

9. A method according to any one of claims 4 to 8, wherein the amount of calcium admitted to the calcium precipitation unit is less than the stoichiometric amount for capturing fluoride and wherein the fluoride containing eluate from the precipitation unit is recycled to the ion adsorption unit to combine with the concentrated fluoride solution.

10. Apparatus for use in carrying out the method of claim 1, the apparatus comprising:

an essentially closed loop circulation system containing (i) an ion adsorption unit comprising a water permeable zone of an ion adsorbing material and means for enabling an electrical potential to be applied across the thickness of that zone and (ii) a reaction unit in which one of the anionic and cationic species is rendered substantially insoluble;

a pump for continuously circulating aqueous solution around the closed loop;

an inlet for an aqueous solution containing anionic and cationic species to the closed loop circulation system;

an outlet for concentrated aqueous solution of one ionic species from the ion adsorption unit;

an outlet for depleted aqueous solution from the ion adsorption unit;

an outlet for solid from the reaction unit; and

an inlet for water into the closed loop circulation system.

11. Apparatus according to claim 10, wherein the reaction unit is a calcium fluoride precipitation unit which comprises an inlet for an aqueous solution or slurry of a calcium source, an inlet for concentrated aqueous fluoride solution, an outlet for calcium fluoride and an outlet for aqueous fluoride eluate.

12. Apparatus according to claim 11, wherein the inlet for the aqueous solution or slurry of the calcium source is operatively connected to a mixing vessel in which the calcium source is mixed with water.

13. Apparatus according to claim 12, wherein the mixing vessel is operatively connected to the outlet for depleted aqueous solution from the ion adsorption unit.

14. Apparatus according to claim 12, wherein the mixing vessel is operatively connected to the outlet for aqueous fluoride eluate from the calcium fluoride precipitation unit.